

LENWEBBIA PALUMA SP. NOV., FROM THE WET TROPICS, NORTHEASTERN QUEENSLAND (PULMONATA: CHAROPIDAE)

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A new species of charopid, *Lenwebbia paluma* sp. nov., is described from the Paluma Range, in the south of the Wet Tropics, NEQ. This discovery establishes a widely disjunct north-south distribution for the genus. The biogeographic significance of this pattern is discussed in relation to rainforest evolution and the specific microhabitat preference of the species. □ *Charopidae, Lenwebbia paluma, systematics, biogeography, Wet Tropics.*

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The charopid fauna of the Wet Tropics, NEQ, is poorly known. Only six species have been described (Odhner, 1917; Hedley, 1924; Stanisic, 1987, 1990). Their small size and limited vagility, and relatively large numbers in eastern Australia make them a potentially powerful tool in biogeography. Stanisic (1987, 1990) has highlighted a number of unusual aspects of the distributions and relationships of several Wet Tropics charopids.

The discovery of a new species of *Lenwebbia* from Mt Spec in the Paluma Range, NEQ, provides an additional opportunity to examine charopid distribution patterns in relation to the evolution of mesic communities in eastern Australia.

The following abbreviations have been used in the text: NEQ, northeastern Queensland; QM, Queensland Museum.

SYSTEMATICS

Family Charopidae

Lenwebbia Stanisic, 1990

Lenwebbia Stanisic, 1990, p.52.

TYPE SPECIES

Lenwebbia protoscribiculata Stanisic, 1990, by original designation.

REMARKS

Lenwebbia is a distinctive genus of charopid characterised by its greatly reduced shell sculpture, and is unlikely to be confused with other northeastern Queensland members of the family. It could be mistaken for some of the Wet Tropics

Helicarionidae, such as *Tarocystis* Iredale, 1937, and *Expocystis* Iredale, 1937, which also have macroscopically featureless shells. However, these genera differ microscopically from *Lenwebbia* in having incised spirals on the protoconch and notched incised grooves on the postnuclear whorls. They also lack the impressed sutures of *Lenwebbia*. The features of *L. paluma* sp. nov. are consistent with the generic diagnosis given by Stanisic (1990).

Lenwebbia paluma sp. nov.
(Figs. 1-4)

ETYMOLOGY

For the type locality, Paluma, NEQ.

COMPARATIVE REMARKS

The shell of *L. paluma* is grossly similar to that of *L. protoscribiculata* Stanisic, 1990, from southeastern Queensland. Differences in *L. paluma* include a smaller umbilicus (D/U ratio 10.5-14.9 compared with 5.34-5.62 for *protoscribiculata*) and finer microsculpture that does not include spiral grooves. The shell of *L. paluma* is also slightly smaller and flatter, due mainly to a smaller body whorl width. Anatomically, the unequal length of the penial pilasters in *L. paluma* contrasts with the condition in *L. protoscribiculata* (Stanisic, 1990, Fig. 30b).

TYPE MATERIAL

HOLOTYPE: QMMO43311, Mt Spec NP, c. 0.5k E Paluma, NEQ (19°01'S, 146°13'E), rainforest, 800m, under bark of trees. Collected by J. Stanisic, D. Potter, 6 May, 1990. Height of shell 2.68mm, diameter 4.30mm, H/D ratio 0.61, D/U ratio 14.6, whorls 4½.

PARATYPES: 2 adults, 5 subadults, QMMO29085, same collection data as holotype.

DIAGNOSIS

Shell (Fig. 1a,b) small, glossy, turbinate, diameter 4.30-4.47mm (mean 4.38mm) with $4\frac{1}{8}$ evenly coiled whorls, the last descending slowly in front. Apex and spire moderately elevated, SP/BWW ratio 0.29-0.44 (mean 0.38), height 2.68-3.06mm (mean 2.82mm). H/D ratio 0.61-0.69 (mean 0.64). Body whorl width 1.45-1.53mm. Apical sculpture (Fig. 2a) of crowded dimples. Protoconch of $1\frac{1}{2}$ whorls, mean diameter 939 μ m. Post-nuclear sculpture (Fig. 2b-d) of weak radial growth ridges, fine crowded threadlike radial ridgelets and irregular spiral cords; sculpture reduced on the base. Umbilicus (Fig. 1b) very narrow, partially covered by reflection of the columella, diameter 0.31-0.41mm (mean 0.38mm), D/U ratio 10.5-14.9 (mean 13.3). Sutures impressed. Whorls rounded above and below the periphery. Lip simple, columella dilated. Parietal callus prominent. Colour brown. Based on three measured adults (QMMO29085, QMMO43311).

Animal colour (in life) grey, becoming darker on the mantle collar, neck, top of foot and in the region between the pedal grooves. Foot short and broad. Pallial cavity (Fig. 3c) with well developed mantle collar (MC) and prominent mantle gland (MG). Pallial roof with black speckling. Kidney (K) subtriangular, orangy-brown with an incomplete sigmurethrous ureter (KD). Ureteric pore (KX) situated in the angle between the kidney and the rectum (HG). Hindvein (HV) prominent. Genitalia (Fig. 3a) with enlarged albumen gland (GG). Ototestis (Fig. 3b, G) consisting of several white clumps of alveoli located in the apical whorls of the digestive gland (Z) and oriented at right angles to the plane of coiling. Epiphallus (E) short, stout, entering penis apically through two fleshy lips (EP). Penis (P) cylindrical, tapering toward atrium (Y), internally (Fig. 3d) with a large fleshy longitudinal pilaster and a shorter, apical, secondary pilaster (PP). Vagina (V) short. Free oviduct (UV) long. Spermatheca (S) typical, stalk (SS) long. Radula with tricuspid central and lateral teeth (Fig. 2e) in which the mesocone is long and lanceolate; anterior flare present. Marginal teeth (Fig. 2f) multicuspid with endocone and ectocone split into several minor cusps. Basal plates squarish, with a central ridge that articulates with the anterior flare of the tooth behind. Based on two dissected specimens (QMMO-29085).



FIG. 1. Shell of *Lenwebbia paluma* sp. nov. Mt Spec NP, 0.5km E Paluma, NEQ, QMMO43311, holotype. Scale line = 3mm.

RANGE AND HABITAT

Known from only the type locality near Paluma, NEQ (Fig. 4). Cooler peaks of this area support rainforest in contrast to the drier eucalypt forest of the foothills. The peaks are not high when compared with mountains of the Wet Tropics, and the altitudinal stratification of rainforest communities is less pronounced. Upper reaches support simple notophyll vine forest which grades into mesophyll vine forest in warmer sheltered gullies. *L. paluma* lives under the bark of standing live or dead trees.

REMARKS

L. paluma has a specialised microhabitat compared with most eastern Australian charopids (including *L. protoscribiculata*) which live under logs. The flatter shell (when compared with *L. protoscribiculata*) is probably an adaptation for this lifestyle. This selective microhabitat may account for the comparative rarity of the species in collections. However, considerable collecting effort in the moister parts of the Wet Tropics, north of the Herbert R., makes it unlikely that the genus has representatives in those forests. Conversely its presence in areas such as the Seaview Ra., Bakers Blue Mtn and Blucwater Ra. cannot be discounted until additional collecting is undertaken.

DISCUSSION

The north-south, widely disjunct distribution of *Lenwebbia* has parallels among other charopid genera (*Setomedea* Iredale, 1941; *Hedleyoconcha* Pilsbry, 1893; *Biomphalopa* Stanisc, 1990). All have species in the Wet Tropics with nearest relatives either in mideastern or southeastern Queensland. However, in contrast to *Lenwebbia*, their northern representatives occur in the northern, moister parts of the Wet Tropics, between

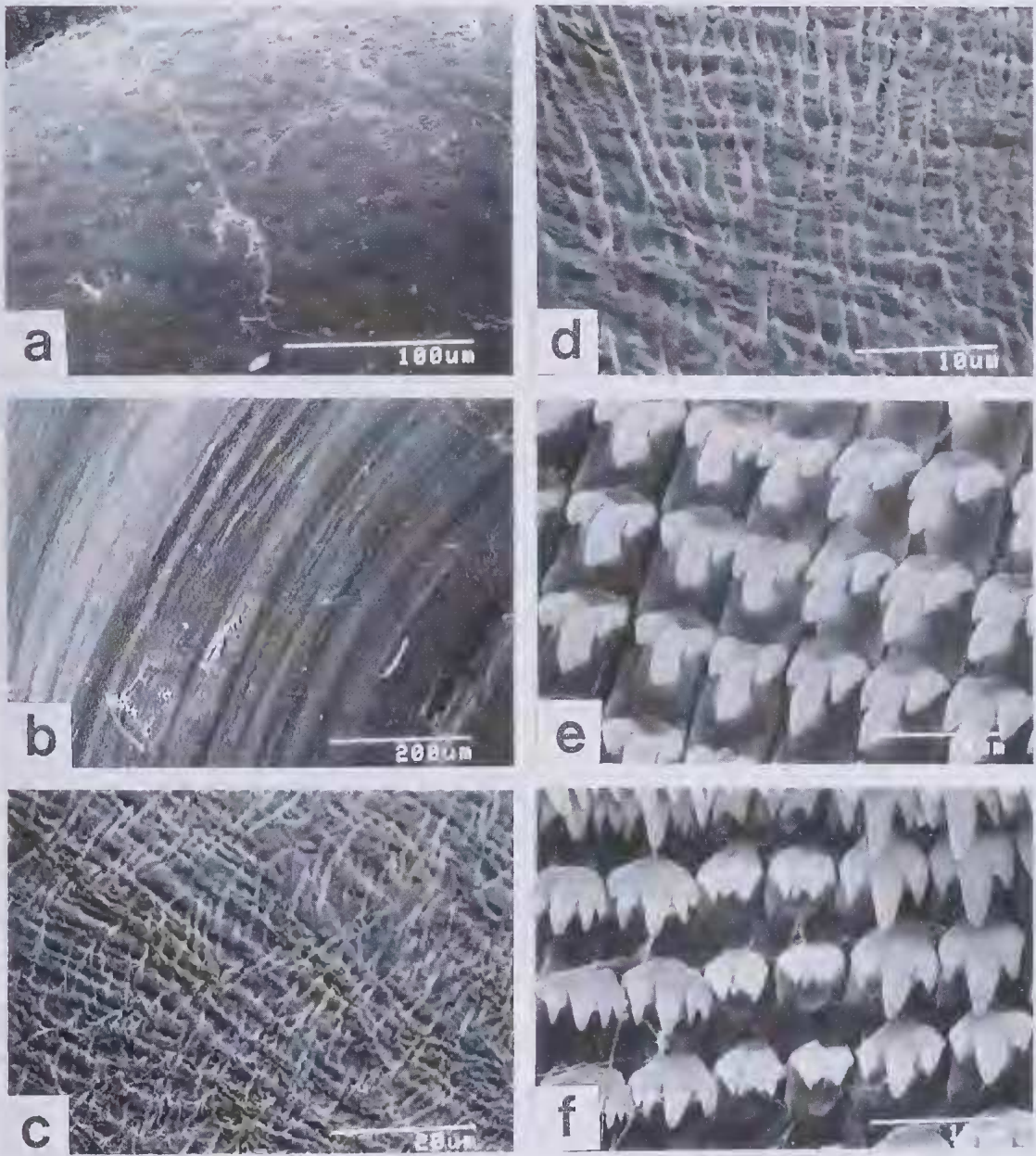


FIG. 2. Shell and radular details of *Lenwebbia paluma* sp. nov. Mt Spec NP, 0.5km E Paluma, NEQ, QMMO29085, paratype. a, protoconch sculpture; b, adult sculpture; c-d, post nuclear microsculpture; e, central and inner lateral teeth; f, marginal teeth (note malformation). Scale lines as marked.

Ingham and Cooktown, NEQ. The restriction of *L. paluma* to the southern, drier end is unusual in this context.

The Paluma Ra. is a southern outlier of the main Wet Tropics rainforest massif. It is wetter than the more northerly Seaview Ra. because of its greater

altitude and closer proximity to the sea, and higher areas have a mean annual rainfall greater than 2000mm. The main vegetation type is simple notophyll vine forest on the summits and mesophyll vine forest at lower elevations (Nix, 1991). The 'temperate' summit communities

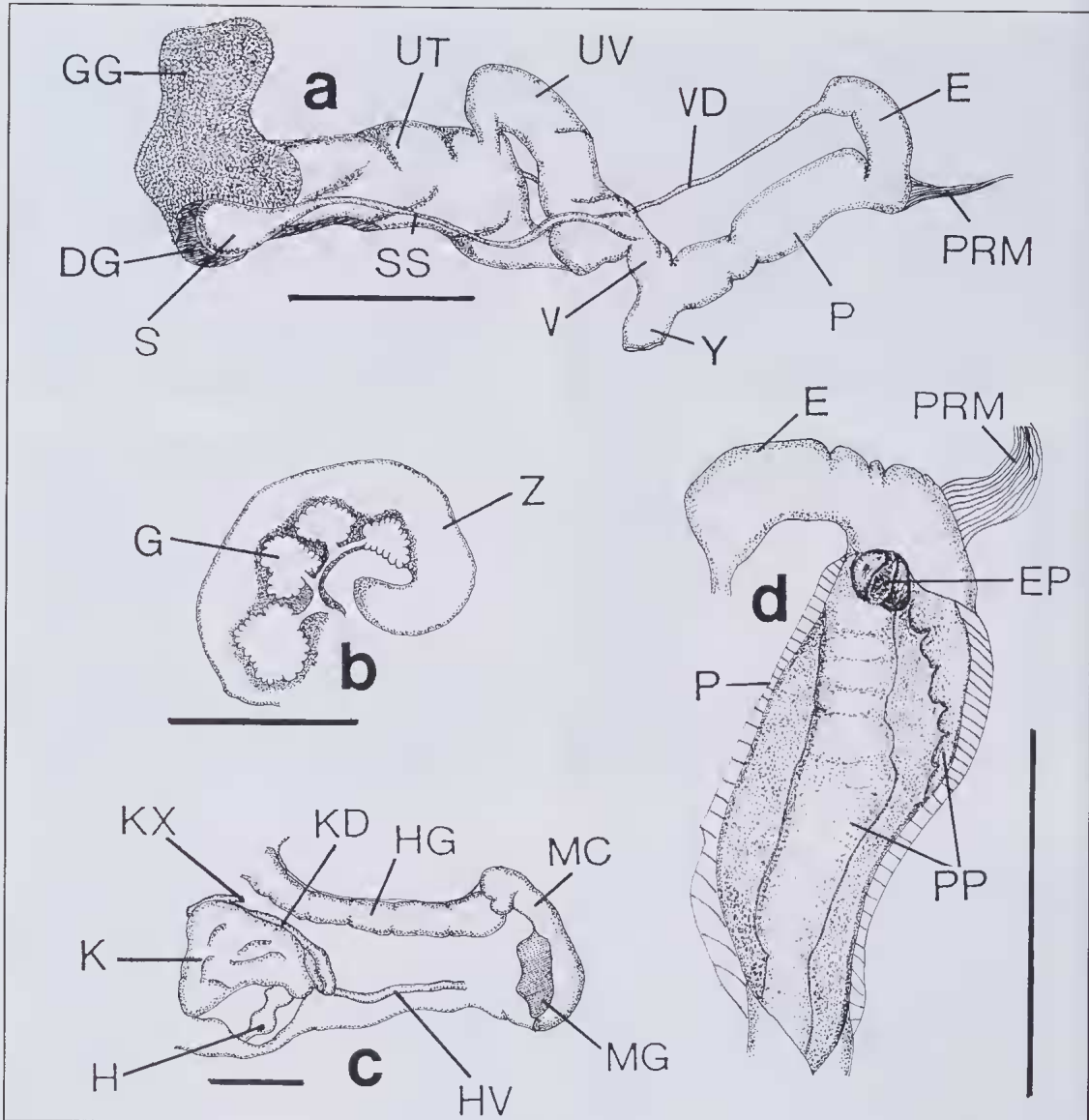


FIG. 3. Anatomy of *Lenwebbia paluma* sp.nov. Mt Spec N.P., 0.5k E Paluma, NEQ. QMMO29085, paratype. a, reproductive system; b, ovotestis; c, pallial structures; d, penis interior. Scale lines = 1mm.

found on mountains further north are absent and Nix (1991) considered that the southern outliers of the Wet Tropics would not have provided significant refuges during the last glacial.

Rainforest in eastern Australia experienced its major retreat in the Pliocene when plant genera such as *Eucalyptus* gained ascendancy and occupied the drier areas vacated by rainforest vegetation (Galloway & Kemp 1981). Major north-south disjunctions evident today in eastern Australian biota probably date from this epoch.

The establishment of the Fitzroy and Burdekin dry corridors (Nix, 1991) fragmented populations of formerly widespread mesic communities. Land snails would have suffered considerable range attrition during the drying of the late Tertiary and Quaternary because of their extreme moisture sensitivity and low vagility. In the Wet Tropics region, temperate and subtropical communities were isolated in upland refugia and, in spite of Holocene 'wet-phases' (Kershaw & Nix, 1988), did not re-emerge because of potent

bioclimatic barriers operating at lower elevations (Nix, 1991). *Lenwebbia* is a significant element of these environmentally-cornered assemblages and the restriction of *Lenwebbia* in the north is inextricably linked with the fragmentation and reduction of rainforest communities since the mid-Miocene.

Nix (1991) has shown a strong association between bioclimates and rainforest structural types. The bioclimatic parameters used (radiation, temperature, moisture and rainfall) translate directly to the critical factors in land snail survival. So it is not surprising that the distribution of rainforest structural types (Webb, 1968) and land snail assemblages (communities) show great coincidence (Stanisic, unpubl.). As indicators of past and present climatic and edaphic profiles rainforest types provide a framework for understanding land snail evolution in eastern Australia. The drying events of the Pliocene, and their more radical effects in the Pleistocene (Galloway & Kemp, 1981) most likely caused the initial fragmentation of *Lenwebbia*. Climatic changes in the last 100,000 years which also caused major vegetation changes in eastern Australia (Kershaw, 1981) probably attenuated the morphological disparities between the northern and southern species.

In the south, *L. protoscribiculata* Stanisic, 1990 is associated with comparatively drier subtropical araucarian microphyll vine forests. It is absent from the wetter refugia of the Border Ranges, which suggests long-term adaptation to a subtropical seasonally moist/dry rainforest type where mean annual rainfall is 900-1100mm (Webb & Tracey, 1981). The araucarian forests which flourish in the south are now only relicts in the north. Pollen sampling on the Atherton Tableland indicates that they were replaced by drier sclerophyll vegetation during the last glacial (38000-26000 BP) (Kershaw, 1981). Dry conditions reached a climax at 17000 BP and persisted until 10000 BP. Prior to this the araucarian forests persisted under a rainfall regime of about 1200mm per annum which is not unlike their present-day requirements in the south. The elimination of this forest type in all but refugia in the north reflects a climatic shift which probably caused significant changes in land snail communities including numerous extinctions. The isolation of *L. paluma* in the Paluma Ra. from the main mass of rainforest further north probably occurred during this period. It is likely that the distribution of *Lenwebbia* in the north was more extensive.

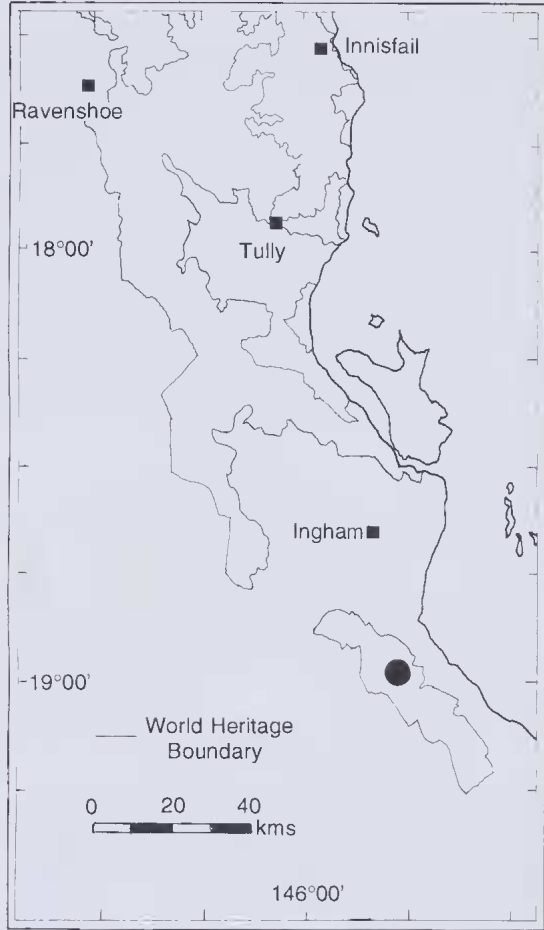


FIG. 4. Distribution of *Lenwebbia paluma* sp. nov. (dot).

Although some recolonisation of areas outside the Paluma Ra. by *Lenwebbia* was possible when major rainforest units and outliers were united during the cool, wet phase of the Holocene (7500-6000 BP) (Kershaw & Nix, 1988; Nix, 1991) this does not appear to have occurred.

L. paluma shows a greater degree of microhabitat specialisation than *L. protoscribiculata*. Its flatter shell with smaller body whorl width is an expression of this major shift to life under bark of trees. This microhabitat specialisation is a likely contributing factor to the current restricted distribution of *Lenwebbia* in the north. Relatively exposed microhabitats and specialised microhabitats presumably have greater probability of perturbation by climatic change. *Hedleyoconcha*, *Lenwebbia* and *Setomedea* all have widespread species in subtropical southeastern Queensland. *Hedleyoconcha* lives in exposed situations on the

leaves, trunks and branches of shrubs and trees. Significantly, *Hedleyoconcha* survives only in the very wet, cloudy moist summits of the Wet Tropics and is absent from the mideastern Queensland rainforests. In contrast, *Setomedeia*, which lives under logs where ambient conditions are considerably more stable, has managed to persist in mideastern Queensland, even in the somewhat drier habit of Mt Dryander. The Wet Tropics species, *S. monteithi* Stanisic, 1990, is comparatively widespread in the uplands, foothills and lowlands (mountain-mass effect?) between Innisfail and Cooktown. In comparison, *Lenwebbia* is absent from mideastern Queensland and has a narrow distribution in the Wet Tropics, a situation not unlike that seen in *Hedleyoconcha*.

Microhabitat specialisation in *L. paluma* may have resulted from the need to adapt to habitat change. However, in the process the species has probably increased its sensitivity to climatic changes. As an environmentally-cornered species, *L. paluma* must be regarded as a key indicator species of the Paluma biogeographic unit of Nix (1991).

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